Claims

1. A chemically bonded biomaterial element composed of an inorganic cement, exhibiting minimal dimensional changes upon hardening and long-time use, improved mechanical properties and improved translucency characterised in an algorithm to describe the micro-structure, which is expressed as

$$\lambda = \frac{d*(1-V_F)}{(V_F)}$$

where λ is the distance between filler particles of mean size d, and V_F is the volume content of non-reacted cement and added filler, and where $\lambda = 10$ μm.

2. A biomaterial element according to claim 1, characterised in that $\lambda = 8$ μm, even more preferred $\lambda = 4$ μm and most preferred $\lambda = 2$ μm.

3. A biomaterial element according to claim 1 or 2, characterised in that V_F is less than 50 %, preferably 5-45 % and even more preferred 15-35 %.

4. A biomaterial element according to any one of the preceding claims, characterised in that it exerts a pressure or tensile force of < 5 MPa, even more preferred < 2 MPa and even more preferred < 1 MPa, on a surrounding volume.

5. A biomaterial element according to any one of the preceding claims, characterised in that the inorganic phase is composed of Ca-aluminate and/or Ca-silicate and/or Ca-phosphate.

6. A biomaterial element according to any one of the preceding claims, characterised in that the inorganic phase is composed of phases in the $CaO-Al_2O_3$ system, i.e. CaO, $(CaO)_3Al_2O_3$, $(CaO)_{12}(Al_2O_3)_7$, $CaOAl_2O_3$, $(CaO)(Al_2O_3)_2$, $(CaO)(Al_2O_3)_6$ and/or pure Al_2O_3 with varying relative contents, where the preferred main phases are $CaOAl_2O_3$ and $(CaO)(Al_2O_3)_2$ and the most preferred main phase is $CaOAl_2O_3$, a particle size of formed hydrates of these phases being below 3 μm, even more preferred below 1 μm and most preferred below 0.5 μm.

7. A biomaterial element according to any one of the preceding claims, characterised in that it also comprises an organic phase of preferably polyacrylates and/or polycarbonates and preferably at a volume content of < 5 %.

8. A biomaterial element according to any one of the preceding claims, characterised in that added inert filler particles have a particle size below 5 μm, even more preferred below 2 μm.

9. A biomaterial element according to claim 8, characterised in that added filler particles consist of glass particles, apatites, brucite and/or böhmite.

10. A biomaterial element according to any one of the preceding claims, characterised in that it comprises in-situ formed apatite or some other phase that separates the formed hydrates of the main system.

11. A biomaterial element according to any one of the preceding claims, characterised in that a total porosity is below 10 %, even more preferred below 5 %, distributed on minipores having a diameter below 0.5 μm, even more preferred below 0.1 μm, to an extent of at least 90 % of the total porosity.

12. A biomaterial element according to any one of the preceding claims, characterised in that it is a dental material, preferably a dental filling material or a root filling material.

13. A biomaterial element according to any one of the preceding claims, characterised in that it is an orthopaedic material or a bone cement.

14. A biomaterial element according to any one of the preceding claims, characterised in that it is a component or is in granule form, preferably as a carrier material for drug delivery.

15. A device in connection with the preparation of a chemically bonded biomaterial element according to any one of the preceding claims, from a powdered material comprising a binder phase and a liquid reacting with the binder phase, characterised in that said device comprises a first container (5) that contains the powdered material, and a second container (3) that contains said liquid reacting with the binder phase, and an openable closure (3) between the containers (5, 3).